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(54) HEAT INSULATING COLORED FILM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a heat insulating colored film having excellent heat insulating property and also having color and/or hue required for obtaining an intended fine appearance.

SOLUTION: This heat insulating colored film is obtained by forming a composition comprising a mixed pigment and a thermoplastic resin into a film; wherein the mixed pigment is a combination of two or more primary pigments selected from the group consisting of a white pigment having $\geq 40\%$ solar reflectivity at 780-2,100 nm wavelength, a blue pigment having $\geq 7\%$ solar reflectivity at 780-2,100 nm wavelength, a red pigment having $\geq 8\%$ solar reflectivity at 780-2,100 nm wavelength, a green pigment having $\geq 7\%$ solar reflectivity at 780-2,100 nm wavelength, a yellow pigment having $\geq 10\%$ solar reflectivity at 780-2,100 nm wavelength and a black pigment having $\geq 6\%$ solar reflectivity at 780-2,100 nm wavelength.

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CLAIMS

[Claim(s)]

[Claim 1] It is the thermal insulation nature color film which fabricates the constituent containing a mixed pigment and thermoplastics in the shape of a film, and is obtained. Said mixed pigment The white pigments whose solar reflectance in a 780-2100nm wavelength region is 40% or more, The blue pigment whose solar reflectance in a 780-2100nm wavelength region is 7% or more, The red pigments whose solar reflectance in a 780-2100nm wavelength region is 8% or more, The green pigments whose solar reflectance in a 780-2100nm wavelength region is 7% or more, The yellow pigment whose solar reflectance in a 780-2100nm wavelength region is 10% or more, And the thermal insulation nature color film characterized by being the thing which comes to combine two or more sorts of primary color pigments chosen from the group which the solar reflectance in a 780-2100nm wavelength region becomes from the black pigment which is 6% or more.

[Claim 2] Said thermal insulation nature color film is a thermal insulation nature color film according to claim 1 characterized by being what contains a glass bead 0.1 to 10% of the weight.

[Claim 3] Said thermal insulation nature color film is a thermal insulation nature color film according to claim 1 or 2 characterized by being that by which the adhesive layer is prepared in the one side.

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DETAILED DESCRIPTION**[Detailed Description of the Invention]**

[0001]

[Field of the Invention] By applying to roofs, outer walls, etc., such as the roof of conveyance cars, such as a roof of buildings, such as works and a residence, a shell plate, a container, and a reefer, an outer wall, a vessel, a plant, a lumber room, and a barn, this invention prevents the rise of the internal temperature resulting from sun irradiation, and relates to the thermal insulation nature color film which can moreover also raise a design and a fine sight. The thermal insulation nature color film of this invention is applicable also to the film for outdoor spreading used for covering of a facility, horticulture, etc.

[0002]

[Description of the Prior Art] Although the paint by the coating is usually performed in order that they may prevent this and may raise a fine sight, since the roof and shell plate of a building or a building are exposed to a rainstorm or daylight and tend to deteriorate, the color film according to an application is beforehand produced in recent years for the improvement in workability, and the technique of acquiring the same effectiveness as the paint by the coating simple is performed by arranging this. As for buildings, such as a residence, it is desirable for a film with the operation which suppresses improvement in internal temperature for the improvement in amenity to be used for summer by to always be exposed to daylight, and to use the high film of the thermal insulation effectiveness especially, from it also for reduction of air conditioning costs, such as an air-conditioner for a temperature control. Although the container and the reefer were used widely in connection with the distribution revolution in recent years for transportation in the low-temperature condition, in order to heighten refrigeration and the heat insulation effectiveness, the high film of thermal insulation nature came to be demanded. Moreover, in the field of the film for outdoor spreading used for covering of a facility, horticulture, etc., transparency is required and also it is in the same situation. Thus, while thermal insulation nature is required, various colors are given to a building, a car body, a facility, etc., and improvement in a fine sight is called for in recent years.

[0003] The technique offer the film which has thermal-insulation nature is studied for many years, for example, the technique which vapor-deposits a thin metal layer on a film front face to JP,59-13325,B is indicated, the technique which combines a hologram with a film and uses it for JP,7-274738,A is indicated, and the method of obtaining thermal-insulation nature, using near infrared ray absorption coloring matter as an approach of scouring further the particle which has the thermal-insulation effectiveness is indicated by JP,4-45546,B. However, by such approach, since the film itself absorbed heat, it had resulted in it being inferior in thermal insulation nature after all with subsequent heat dissipation.

[0004] The thermal insulation sheet which carries out the amount content of specification of an aminium system compound or the G MONIUMU system compound to plastic resin is indicated by JP,8-81567,A. However, it was unsuitable for the application for which it is necessary to paint for fine sight grant while this thermal insulation sheet essentially penetrated the visible ray, and its near infrared ray absorption coefficient was high, and it fitted the application of a pressure sensitive adhesive sheet, a printing sheet, an outdoor-type marking film, etc. and required positive thermal insulation nature. The film for outdoor spreading which raised thermal insulation nature is indicated by preparing the layer containing the inorganic oxide particle by which the metal was doped by one side of a thermoplastics film in JP,10-250002,A, and preparing the layer which contains a hydrophilic minerals colloidal particle further. However, it was not that by which transparency should also apply this thing to a required application, and can apply it to an application [coincidence] thermal insulation nature and painting certain.

[0005]

[Problem(s) to be Solved by the Invention] This invention aims at offering the thermal insulation nature color film

which also has color and a hue required to gain the fine sight meant to coincidence while it has the outstanding thermal insulation nature in view of the above-mentioned present condition.

[0006]

[Means for Solving the Problem] This invention is a thermal insulation nature color film which fabricates the constituent containing a mixed pigment and thermoplastics in the shape of a film, and is obtained. The above-mentioned mixed pigment The white pigments whose solar reflectance in a 780-2100nm wavelength region is 40% or more, The blue pigment whose solar reflectance in a 780-2100nm wavelength region is 7% or more, The red pigments whose solar reflectance in a 780-2100nm wavelength region is 8% or more, The green pigments whose solar reflectance in a 780-2100nm wavelength region is 7% or more, The yellow pigment whose solar reflectance in a 780-2100nm wavelength region is 10% or more, And it is the thermal insulation nature color film characterized by being the thing which comes to combine two or more sorts of primary color pigments chosen from the group which the solar reflectance in a 780-2100nm wavelength region becomes from the black pigment which is 6% or more.

[0007] This invention is a thermal insulation nature color film characterized by being that in which the above-mentioned thermal insulation nature color film contains a glass bead 0.1 to 10% of the weight again. This invention is a thermal insulation nature color film further characterized by the above-mentioned thermal insulation nature color film being that by which the adhesive layer is prepared in the one side. This invention is explained in full detail below.

[0008] The constituent containing a mixed pigment and thermoplastics is used in this invention. The above-mentioned mixed pigment has combined the primary color pigment which are two or more primary color pigments, and has the solar reflectance of the specific range. In this specification, the "solar reflectance" about a pigment means the solar reflectance obtained by measuring the film-like object which fabricates the constituent which contains the pigment concerned with thermoplastics on the basis of the same conditions in the shape of a film, and is obtained. The meaning of the vocabulary of "solar reflectance" is JIS. A It is indicated by 5759, and although it is a 350-2100mm wavelength region there, the "solar reflectance" in this specification shall mean the reflection factor which carried out weight attachment with the reinforcement for every wavelength in the 780-2100nm wavelength region of sunlight.

[0009] The above-mentioned mixed pigment is obtained by combining the primary color pigment which are white pigments, a blue pigment, red pigments, green pigments, a yellow pigment, and each primary color pigment of a black pigment, and has the solar reflectance of the above-mentioned regularity.

[0010] Although the solar reflectance of the above-mentioned white pigments can do the effectiveness of this invention so if it is 40% or more, it is 50% or more preferably. Although the solar reflectance of the above-mentioned blue pigment can do the effectiveness of this invention so if it is 7% or more, it is 10% or more preferably. Although the solar reflectance of the above-mentioned red pigments can do the effectiveness of this invention so if it is 8% or more, it is 15% or more preferably, and is 20% or more more preferably.

[0011] Although the solar reflectance of the above-mentioned green pigments can do the effectiveness of this invention so if it is 7% or more, it is 10% or more preferably. Although the solar reflectance of the above-mentioned yellow pigment can do the effectiveness of this invention so if it is 10% or more, it is 20% or more preferably, is 25% or more more preferably, and is 30% or more still more preferably. Although the solar reflectance of the above-mentioned black pigment can do the effectiveness of this invention so if it is 6% or more, it is 10% or more preferably.

[0012] Although characterized by toning the above-mentioned mixed pigment by combining two or more sorts in the primary color pigment which has solar reflectance within fixed limits as mentioned above, the technique which is going to raise thermal insulation nature using the pigment which has solar reflectance within fixed limits in this way does not exist until now, but this invention persons hit on an idea of it for the first time. A primary color pigment can create the color film which has all colors and hues by using the pigment described here here.

[0013] Actuation of acquiring specific color and a specific hue etc. is meant by mixing combining here, for example. Although the technique which acquires different various colors and hues from the color which these primary color pigments discover by mixing a primary color pigment, or a hue, and tones a pigment by this existed until now The technique which acquires different various colors and hues from such primary colors, and tones a mixed pigment by this does not exist until now, and this invention persons will not find it out without combining the primary color pigment which has the solar reflectance of fixed within the limits.

[0014] Since all kinds that can be considered about, such as the gray which is for example, a light-coloring color when the above-mentioned mixed pigment changes the class and amount of the primary color pigment to be used, blue, Green, ivory, Orange, Brown that is inside coloring, wine red, a red rust color which is dark coloring, dark green, dark blue, and black Brown, of hues, lightness, and saturation can be obtained, the degree of freedom on toning will become high by leaps and bounds.

[0015] The following pigment etc. can be mentioned as a primary color pigment used for the above-mentioned mixed

pigment. As white pigments, the titanium CR 97 (the Ishihara Titan Kogyo K.K. make) which is titanium oxide can be mentioned. As a black pigment, it is Fastogen. Super Black MX (Dainippon Ink & Chemicals, Inc. make), PARIOGEN Schwarz S0084 (BASF A.G. make), PARIO toll black L0080 (BASF A.G. make) etc. can be mentioned. Furthermore, Symuler Fast Yellow 4192 (Dainippon Ink & Chemicals, Inc. make), first gene red 7100Y (Dainippon Ink & Chemicals, Inc. make) and RIONORU -- blue What mixed FG7908 (Dainichiseika Colour & Chemicals Mfg. Co., Ltd. make) can be mentioned.

[0016] As a blue pigment, it is Fastogen. Blue 5485 (Dainippon Ink & Chemicals [, Inc.] make) Fastogen Blue RS (Dainippon Ink & Chemicals, Inc. make) and cyanine blue 5240KB (Dainichiseika Colour & Chemicals Mfg. Co., Ltd. make) etc. can be mentioned. As red pigments, it is Fastogen. Super Magenta RH (Dainippon Ink & Chemicals, Inc. make), Fastogen Red 7100Y (Dainippon Ink & Chemicals, Inc. make), ruby cron red 400RG (Dainippon Ink & Chemicals, Inc. make), etc. can be mentioned.

[0017] As a yellow pigment, it is Symuler. Fast Yellow 4192 (Dainippon Ink & Chemicals, Inc. make), SHIKOPARU yellow L-1110 (BASF A.G. make) etc. can be mentioned. As green pigments, first gene green 2YK (Dainippon Ink & Chemicals, Inc. make), RIONORU Green 6 YKP-N (TOYO INK MFG. CO., LTD. make), etc. can be mentioned.

[0018] Since the above-mentioned primary color pigment is within the limits of the solar reflectance of the above-mentioned regularity, respectively, it is usable enough as a primary color pigment of the above-mentioned mixed pigment. The color film obtained using the pigment of each color presents the primary color according to each of that color, and the above-mentioned primary color pigment has the Lab value demanded in each color. For example, white pigments have the value of Lab96.2/-0.6/1.9, a blue pigment has the value of -31 13/14/of Lab(s), red pigments have the value of Lab32/46/15, green pigments have the value of Lab18/-2/0, a yellow pigment has the value of Lab69/-3/44, and a black pigment has the value of -1 12/2/of Lab(s).

[0019] The thermal insulation nature color film of this invention carries out melting kneading of for example, the above-mentioned mixed pigment and the thermoplastics, obtains a constituent, can fabricate this in the shape of a film with a calender making machine, a T-die extruder, etc., and can obtain it by making with a film-like object. As the above-mentioned constituent, if the above-mentioned mixed pigment and thermoplastics are contained, other components may be contained and luminosity material, a bulking agent, an additive, etc. can be mentioned as the above and other components.

[0020] The resin usually used for fabricating a film as a principal component as the above-mentioned thermoplastics can be used. Although not limited especially, for example Vinyl chloride system resin, vinylidene-chloride system resin, Polyethylene system resin, a polypropylene resin, acrylic-acid (meta) system resin, (Meta) Acrylic ester system resin, polyester system resin, polystyrene system resin, acrylonitrile-butadiene-styrene copolymer system resin, acrylonitrile styrene copolymer system resin, polycarbonate system resin, etc. can be mentioned. They are vinyl chloride system resin and acrylic ester (meta) system resin preferably among these. these thermoplastics may be used independently -- two or more sorts may be used together.

[0021] The above-mentioned constituent can be made to contain luminosity material if needed. As the above-mentioned luminosity material, metallic foils, such as a mica, aluminium foil, the tinfoil, gold foil, silver foil, titanium gold foil, a stainless steel foil, and nickel, copper, etc. can be mentioned, for example.

[0022] The above-mentioned constituent may contain the particle-like bulking agent if needed. The particle and the fibrous or granular detailed glass which are not limited especially as a particle bulking agent of the above, for example, consist of SiO₂, TiO₂, aluminum 2O₃, Cr 2O₃, ZrO₂, aluminum 2O₃ and SiO₂, 3aluminum 2O₃ and 2SiO₂, a silicic-acid zirconia, a ceramic bead, etc., a glass bead, etc. can be mentioned. Any of the shape of the shape of a particle, a globular shape, and a hollow ball are sufficient as the shape of an above-mentioned particle.

[0023] The above-mentioned constituent may contain the additive if needed. It is not limited especially as the above-mentioned additive, for example, a modifier, a thermostabilizer, a plasticizer, an antioxidant, light stabilizer, lubricant, an antistatic agent, a flame retarder, etc. can be mentioned. It is not limited especially as the above-mentioned modifier, for example, methyl-methacrylate-Butadiene Styrene system resin, acrylonitrile-butadiene-styrene copolymer system resin, chlorinated polyethylene, ethylene-vinylacetate copolymer system resin, polyacrylate, etc. can be mentioned.

[0024] It is not limited especially as the above-mentioned thermostabilizer, for example, barium stearate, calcium stearate, zinc stearate, triphenyl phosphite, epoxidized soybean oil, a hydrotalcite, etc. can be mentioned. It is not limited especially as the above-mentioned plasticizer, for example, epoxy system plasticizers, such as phthalic ester, adipate, sebacic-acid ester, azelate, phosphoric ester, trimellitic acid ester, a polyester system polymer plasticizer, epoxidized soybean oil, and epoxidation linseed oil, etc. can be mentioned.

[0025] It is not limited especially as the above-mentioned anti-oxidant, for example, the Lynn system anti-oxidants, such as phenolic antioxidants, such as n-octadecyl-3-(3', 5'- G t-butyl -4'-hydroxyphenyl) propionate, and tris (2, 4-G t-

buthylphenyl) phosphite, etc. can be mentioned. It is not limited especially as the above-mentioned light stabilizer, for example, benzotriazol system light stabilizer, such as benzophenone system light stabilizer, such as 2-hydroxy-4-methoxybenzophenone, and 2-(2'-hydroxy-5'-methylphenyl) benzotriazol, etc. can be mentioned.

[0026] It is not limited especially as the above-mentioned lubricant, for example, a KARUBANA wax, a montan wax, paraffin wax, polyethylene wax, butyl stearate, etc. can be mentioned. It is not limited especially as the above-mentioned antistatic agent, for example, a glycerine fatty acid ester, polyethylene oxide, etc. can be mentioned. It is not limited especially as the above-mentioned flame retarder, for example, inorganic system flame retarders, such as the Lynn system flame retarders, such as bromine system flame retarders, such as deca BUROMO diphenyloxide, and red phosphorus, an aluminum hydroxide, and a magnesium hydroxide, etc. can be mentioned.

[0027] Combination of the primary color pigment in the above-mentioned constituent can be performed by mixing, for example. With the above-mentioned mixing, it can carry out by paying two or more sorts of above-mentioned primary color pigments in a suitable container, and stirring them with thermoplastics, and a ribbon blender, a Henschel mixer, etc. can be used in this case. The amount and class of the above-mentioned primary color pigment to be used can take into consideration the color which it is going to acquire, a hue and lightness, and saturation, and can choose them suitably.

[0028] The above-mentioned constituent obtained as mentioned above is fabricated in the shape of a film, is used as a film-like object, and serves as a thermal insulation nature color film of this invention. As for the thermal insulation nature color film of this invention, it is desirable that it is a thing containing the above-mentioned glass bead. When the thermal insulation nature color film of this invention contains the above-mentioned glass bead, it can give design nature to the above-mentioned thermal insulation nature color film while the thermal insulation nature of the above-mentioned glass bead of the thermal insulation nature color film obtained since it reflects without thermal conductivity absorbing heat energy, such as sunlight, low improves more.

[0029] Although the above-mentioned glass bead mainly consists of glass and it is filled with glass to the interior, a thing in the air may be used, and since thermal conductivity is low excellent in adiathermic, a thing in the air can improve thermal insulation nature further. Although hollow here means the structure which opening pore structure, the vesicular structure, and the centrum have closed, since the constituent which forms the above-mentioned primary color pigment, the above-mentioned mixed pigment, or the above-mentioned thermal insulation nature color film enters the interior and may reduce thermal insulation nature, front 2 persons have the desirable structure which the centrum has closed. Although the configurations of the above-mentioned glass bead may be a globular shape, a needle, tabular, and pillar-shaped **, since they improve thermal insulation nature by the outstanding thermal reflection, the shape of a ball is desirable. As for the above-mentioned glass bead, it is desirable that they are transparence, translucent, white, or opalescence. Since it excels in thermal reflection that the above-mentioned glass beads are these colors, thermal insulation nature is high and there is little effect which it has on the color of the thermal insulation nature color film of this invention.

[0030] As for the particle diameter of the above-mentioned glass bead, it is desirable that it is 1-150 micrometers. If the particle diameter of the above-mentioned glass bead exceeds 150 micrometers, the workability at the time of manufacture of the constituent containing the above-mentioned mixed pigment and thermoplastics and shaping of the above-mentioned film-like object gets worse, and it may be inferior to the appearance and physical properties of a thermal insulation nature color film which are acquired, and the thermal insulation nature by adding the above-mentioned glass bead will not fully be obtained in less than 1 micrometer. The particle diameter of the above-mentioned glass bead is 5-100 micrometers more preferably, and is 8-80 micrometers still more preferably. There is especially no need that the particle diameter of the above-mentioned glass bead is uniform, and it may be distributed broadly. Since distribution of the above-mentioned glass bead in the thermal insulation nature color film of this invention becomes good as a result of a small particle's being able to enter between [of a big path] particles, when distribution of the above-mentioned particle diameter is broad, the thermal insulation nature of the thermal insulation nature color film obtained can be improved further.

[0031] As the above-mentioned glass bead, especially if it has the above-mentioned property, it will not be limited, for example, CEL-STAR (Asahi glass company make) and HSC-110 (Toshiba Ballotini Co., Ltd. make) can be mentioned. When the thermal insulation nature color film of this invention contains the above-mentioned glass bead, as for the content of the above-mentioned glass bead, it is desirable that it is 0.1 - 10% of the weight of the above-mentioned thermal insulation nature color film. When the thermal insulation nature by the above-mentioned content adding the above-mentioned glass bead at less than 0.1 % of the weight is not fully obtained but exceeds 10 % of the weight, there is a possibility of causing the fluid aggravation when fabricating the above-mentioned constituent in the shape of a film and physical-properties degradation of a thermal insulation nature color film obtained. It is 0.5 - 8 % of the weight more

preferably, and is 1 - 6 % of the weight still more preferably.

[0032] When it is not limited, for example, the above-mentioned constituent is obtained especially as an approach of making the above-mentioned thermal insulation nature color film containing the above-mentioned glass bead, and when fabricating/or the above-mentioned constituent in the shape of a film, the above-mentioned glass bead can be added.

[0033] Although the thickness of the above-mentioned film-like object which constitutes the thermal insulation nature color film of this invention can be suitably chosen according to the purpose in the case of applying the thermal insulation nature color film of this invention, its 50-500 micrometers are desirable, and it is 100-300 micrometers more preferably, for example.

[0034] An adhesive layer can be prepared in the above-mentioned film-like object at the one side. By doing in this way, in case the thermal insulation nature color film of this invention is applied to a base material, an adhesive property with a base material can be raised, or workability can be raised.

[0035] As a binder used for the above-mentioned adhesive layer, synthetic resin, such as rubber; Pori (meta) acrylate, such as styrene-isoprene-styrene block-copolymer rubber, styrene-butadiene-styrene block-copolymer rubber, a styrene butadiene rubber, polybutene rubber, polyisoprene rubber, isobutylene isoprene rubber, silicone rubber, natural rubber, and synthetic polyisoprene rubber, polyvinyl ether, polyurethane, polyester, a polyamide, and an ethylene system copolymer, etc. can be mentioned, for example. They are Pori (meta) acrylate, natural rubber, and styrene-isoprene-styrene block-copolymer rubber preferably among these. These binders may be used independently and two or more sorts may be used together.

[0036] A plasticizer, a tackifier, a bulking agent, an antioxidant, etc. may be further used together by the above-mentioned binder. As the above-mentioned plasticizer, a liquid paraffin, palm oil, beeswax, a cull navarho, palm oil, polybutene, lanolin, process oil, castor oil, cotton seed oil, etc. can be mentioned, for example.

[0037] as the above-mentioned tackifier -- BIKOPERU resin, rosin ester, terpene resin, rosin ester H, a pico light, and a stevedore -- light resin, beta-BINEN polymer, etc. can be mentioned.

[0038] As the above-mentioned bulking agent, a calcium carbonate and silicas can be mentioned, for example. As the above-mentioned antioxidant, 4 and 4-dioxy diphenyl, a dioxy diphenylmethane derivative, etc. can be mentioned, for example.

[0039] The thickness of the above-mentioned adhesive layer has 0.005-0.20 desirablenmm. If adhesion becomes it weak that it is less than 0.005mm and it exceeds 0.20mm, cohesive force will fall and it will become easy to generate the paste remainder.

[0040] In preparing the above-mentioned adhesive layer in one side of the above-mentioned film-like object, the approach of drying it, after applying the above-mentioned binder, the method of sticking the tape which has an adhesive layer in both sides, etc. can be mentioned to the approach and the above-mentioned film-like lifter which carry out the laminating of the layer which consists of the above-mentioned film-like object and a binder, for example, and it can be suitably chosen as them according to the purpose of this invention.

[0041] It can arrange easily on a base material, and since the thermal insulation nature color film of this invention is a film-like, in the condition, by simple approaches, such as heating and pressurization, it can install on a base material easily, and the thermal insulation nature color film of this invention which has an adhesive layer can prevent peeling after installation, and desorption while it prevents that a film shifts and raises workability and accuracy in the case of the above-mentioned arrangement.

[0042] It is not limited especially as a base material which applies the thermal insulation nature color film of this invention, for example, a metal base, a plastics base material, an inorganic material base material, etc. can be mentioned. As the above-mentioned metal base, an aluminum plate, a griddle, a galvanized steel sheet, an aluminum galvanized steel sheet, a stainless plate, a tin plate, etc. can be mentioned, for example. As the above-mentioned plastics base material, an acrylic board, a polyvinyl chloride plate, a polycarbonate plate, an ABS plate, a polyethylene terephthalate plate, a polyolefine plate, etc. can be mentioned. As the above-mentioned inorganic base material, it is JIS. A 5422 JIS A A ceramic industry system base material, a glass base material, etc. which were indicated by the 5430th grade can be mentioned.

[0043] Surface treatment may be performed for [for the improvement in adhesion] rust-proofing nature grant, and the primer, the primer, and an intermediate coat may be painted, the rear-face coating may be painted and the above-mentioned base material can be suitably chosen as the rear face of a base material according to the purpose of use.

[0044]

[Example] Although an example is hung up over below and this invention is explained to it in more detail, this invention is not limited only to these examples.

(Selection of a primary color pigment)

1. To the vinyl-chloride-resin 100 weight section of the red constituent degree of polymerization 1100, it is first gene red 500RG (Dainippon Ink & Chemicals, Inc. make.) as barium stearate and zinc stearate, and a pigment as a plasticizer as the polyester system polymeric plasticizer (Asahi Denka Kogyo K.K. make) 35 weight section and a stabilizer. It considers as red pigments 1. Two weight sections were added, it mixed using the ribbon blender, and the red constituent 1 was obtained.

[0045] 2. To the vinyl-chloride-resin 100 weight section of the yellow constituent degree of polymerization 1100, it is the SHIKOPARU yellow L-1110 (BASF A.G. make.) as barium stearate and zinc stearate, and a pigment as a plasticizer as the polyester system polymeric plasticizer (Asahi Denka Kogyo K.K. make) 35 weight section and a stabilizer. It considers as the yellow pigment 1. Two weight sections were added, it mixed using the ribbon blender, and the yellow constituent 1 was obtained. Similarly, the yellow constituent 2 was obtained using the SHIMURA Fast Yellow 4192(Dainippon Ink & Chemicals, Inc. make) 2 weight section.

[0046] 3. To the vinyl-chloride-resin 100 weight section of the blue constituent degree of polymerization 1100, it is Fastogen as barium stearate and zinc stearate, and a pigment as a plasticizer as the polyester system polymeric plasticizer (Asahi Denka Kogyo K.K. make) 35 weight section and a stabilizer. Blue RS(Dainippon Ink & Chemicals, Inc. make) 2 weight section was added, it mixed using the ribbon blender, and the blue constituent 1 was obtained. Similarly, the blue constituent 2 was obtained using the cyanine blue 5240KB(Dainichiseika Colour & Chemicals Mfg. Co., Ltd. make) 2 weight section.

[0047] 4. The polyester system polymeric plasticizer (Asahi Denka Kogyo K.K. make) 35 weight section was added as a plasticizer, the RIONORU Green 6 YKP-N(TOYO INK MFG. CO., LTD. make) 2 weight section was added to the vinyl-chloride-resin 100 weight section of the green constituent degree of polymerization 1100 as barium stearate and zinc stearate, and a pigment as a stabilizer, it mixed using the ribbon blender, and the green constituent 1 was obtained. Similarly, the green constituent 2 was obtained using the first gene green 2YK(Dainippon Ink & Chemicals, Inc. make) 2 weight section.

[0048] 5. To the vinyl-chloride-resin 100 weight section of the black constituent degree of polymerization 1100, it is Fastogen MX (Dainippon Ink & Chemicals, Inc. make.) as barium stearate and zinc stearate, and a pigment as a plasticizer as the polyester system polymeric plasticizer (Asahi Denka Kogyo K.K. make) 35 weight section and a stabilizer. Super Black It considers as a black pigment 1. Two weight sections were added, it mixed using the ribbon blender, and the black constituent 1 was obtained. Similarly, it is PARIOGEN Schwarz S0084 (BASF A.G. make.). It considers as a black pigment 2. The black constituent 2 was obtained using 2 weight sections.

[0049] 6. To the vinyl-chloride-resin 100 weight section of the white constituent degree of polymerization 1100, it is titanium CR 97 (the Ishihara Titan Kogyo K.K. make.) as barium stearate and zinc stearate, and a pigment as a plasticizer as the polyester system polymeric plasticizer (Asahi Denka Kogyo K.K. make) 35 weight section and a stabilizer. It considers as white pigments 1. Two weight sections were added, it mixed using the ribbon blender, and the white constituent 1 was obtained.

[0050] (Measurement of solar reflectance) each of the primary color constituent obtained as mentioned above -- a spectrum -- the reflectance spectrum was measured. The class product was fabricated in the shape of a film with the calendering roll, and the film-like object with a thickness of 250 micrometers was obtained. About this, it measured using the spectrophotometer (the Hitachi, Ltd. make, U-3500 spectrophotometer). Based on the reflection factor in a 780-2100-micrometer wavelength region, it is JIS. A According to the approach of a publication, solar reflectance was computed to 5759. The result was shown in Table 1.

[0051]

[Table 1]

原色組成物	日射反射率(%)
赤色組成物1	23
黄色組成物1	35
黄色組成物2	30
青色組成物1	15
青色組成物2	13
綠色組成物1	15
綠色組成物2	17
黒色組成物1	12
黒色組成物2	20
白色組成物1	50

[0052] Conventionally, as elegance, it was used for steel plate paint and the solar reflectance in a 780-2100nm wavelength region prepared three kinds of following low solar reflectance color films which come to contain less than 6% of a pigment and thermoplastics.

Black system color film (the low solar reflectance color film 1, trade name NF FC24504-R107, Riken Vinyl Industry Co., Ltd. make)

Gray color system color film (the low solar reflectance color film 2, trade name W B794, Riken Vinyl Industry Co., Ltd. make)

Brown system color film (the low solar reflectance color film 3, trade name AWF FC92593-R100, Riken Vinyl Industry Co., Ltd. make)

[0053] It considers as a mixed pigment combining the primary color pigment used in order to prepare the primary color constituent shown in Table 1 by the following ratio. (Preparation of a thermal insulation nature color film) As thermoplastics the vinyl chloride resin of a degree of polymerization 1100 Furthermore, the 100 weight sections, As a plasticizer, the polyester system polymer-plasticizer (Asahi Denka Kogyo K.K. make) 35 weight section, By adding the ceramic bead 6 weight section as a bulking agent, adding barium stearate and zinc stearate as a stabilizer, and mixing using a ribbon blender The high solar reflectance color constituents 1, 2, and 3 were prepared, the obtained class product was fabricated with a thickness of 250 micrometers in the shape of a film with the calendering roll, and the thermal insulation nature color films 1, 2, and 3 of this invention were obtained so that it might have the same color as the above-mentioned low solar reflectance color films 1, 2, and 3.

[0054] It is [black pigment / 2 / black system quantity solar reflectance color constituent 1] 1 weight section [0055] about 5 weight sections yellow pigment 1 in the 100 weight sections white pigments 1. It is 1 weight section [0056] about the 100 weight sections black pigment 2 in gray color system quantity solar reflectance color constituent 2 white pigments 1. They are [white pigments / 1 / brown system quantity solar reflectance color constituent 3 / black pigment / 2 / 100 weight sections] 60 weight sections [0057] about 70 weight sections yellow pigment 1 in the 100 weight sections red pigments 1. To each of the above-mentioned quantity solar reflectance color constituents 1, 2, and 3, as a glass bead, CEL-STAR (Asahi glass company make) was added so that it might become 4% of the weight of the thermal insulation nature color film containing a glass bead which can be obtained, it mixed with the mixer (ribbon blender), and the obtained class product was fabricated with a thickness of 250 micrometers in the shape of a film with the calendering roll, and the thermal insulation nature color films 1, 2, and 3 containing a glass bead were obtained. The hue of each color film was shown in Table 2.

[0058] (Production of a test piece) On the SPC dull steel sheet base material with a thickness of 0.8mm, the above-mentioned low solar reflectance color films 1, 2, and 3 have been arranged, and were used as the test piece at the thermal insulation nature color films 1, 2, and 3 of this invention obtained as mentioned above and the thermal insulation nature color films 1, 2, and 3 containing a glass bead, and a list.

(Measurement of thermal insulation nature) About the test piece, thermal insulation nature was evaluated using the testing device 8 shown in drawing 1 . As shown in drawing 1 , the test piece 1 was irradiated with the incandescent lamp

2 which it inserted in the test piece 1 upwards on it as the film layer became the top face of the styrene foam box 6, and prepared it above the test piece 1, temperature was measured with the thermo sensor 3 installed in the rear face of a test piece 1, and measurement temperature was recorded with the recorder 4. Moreover, the incandescent lamp 2 was made to turn on according to a power source 5.

[0059] As a test piece, that whose dimension is 320mmx230mm was used. As a trial box 6, thickness is 30mm and the styrene foam box whose dimension is 350mmx250mmx250mm was used. Moreover, distance 7 of a test piece 1 and an incandescent lamp 2 was set to 150mm.

[0060] As an incandescent lamp 2, Toshiba REFURAMPU RF110V200W (Toshiba Corp. make) were used, using thermostat recorder RT-10 (Tabai Espec Corp. make) as a recorder 4. Moreover, the trial was carried out in the calm condition in the 20-degree C thermostatic chamber. The result was shown in Table 2.

[0061]

[Table 2]

カラーフィルム	色相			基板表面温度 (°C)
	L	a	b	
遮熱性カラーフィルム1	18	3	5	58
ガラスビーズ入り 遮熱性カラーフィルム1	20	2	4	57
低日射反射率カラーフィルム1	20	0	0.3	110
遮熱性カラーフィルム2	82	0	2	57
ガラスビーズ入り 遮熱性カラーフィルム2	84	0	2	55
低日射反射率カラーフィルム2	83	0	1	75
遮熱性カラーフィルム3	33	3.5	5.2	60
ガラスビーズ入り 遮熱性カラーフィルム3	35	3.5	5.2	60
低日射反射率カラーフィルム3	35	3	5	100

[0062] The thermal insulation nature color films 1, 2, and 3 of this invention and the thermal insulation nature color films 1, 2, and 3 containing a glass bead have the same hue as the low solar reflectance color films 1, 2, and 3, lightness, and saturation, and a fine sight top gives the same effectiveness. However, the remarkable temperature rise was seen, to thermal insulation nature not being expectable, a temperature rise is hardly seen, but thermal insulation nature is excellent, and thermal insulation nature was [the thermal insulation nature color films 1, 2, and 3 containing a glass bead of this invention had the still smaller temperature rise, and] more excellent [as for the thermal insulation nature color films 1, 2 and 3 of this invention] in the low solar reflectance color films 1, 2, and 3.

[0063]

[Effect of the Invention] since the thermal insulation nature color film of this invention has the above-mentioned configuration, it has the thermal insulation nature which was markedly alike and was excellent, and has the same color tone as elegance moreover conventionally, and is excellent in workability or workability.

[Translation done.]

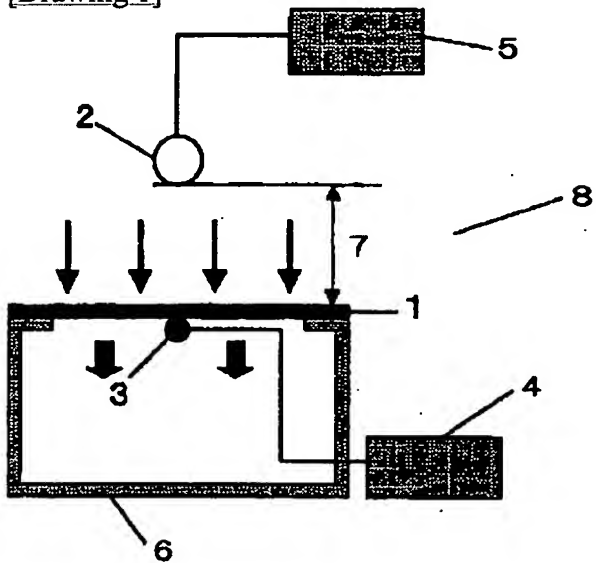
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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



[Translation done.]